

(C) REMARKS

Claims 1-16 are pending in the present patent application and all claims are rejected by the Examiner in this Office Action. Applicant amends claims 4-9 in this response to correct typographical errors only. Applicant traverses the Examiner's claim rejections, as discussed below.

Claim 4 is amended to correct a typographical error by relocating a misplaced phrase. First, the phrase "selected type of operator with the selected" is inserted after the 3rd word in line 6 of claim 4. This first amendment makes the wording in the limitation given in lines 6-8 of claim 4 consistent with the corresponding wording in step 106 of figure 1 and as discussed in paragraph [0040] of the specification of the application as filed. This first amendment also makes the wording referring to pairs of operator half-lengths in the limitation given in lines 6-8 of claim 4 consistent with the wording referring to operator lengths in the corresponding limitation given in lines 9-11 of claim 3. Second, the phrase "selected type of operator with the" is deleted after the 3rd word in line 9 of claim 4. This second amendment makes the wording in the limitation given in lines 9-12 of claim 4 consistent with the corresponding wording in step 107 of figure 1 and as discussed in paragraph [0041] of the specification of the application as filed. This second amendment also makes the wording referring to pairs of operator half-lengths in the limitation given in lines 9-12 of claim 4 consistent with the wording referring to operator lengths in the corresponding limitation given in lines 12-14 of claim 3.

Claims 5, 7, 8, and 9 are corrected to correct a typographical error by changing the phrase "varying operator lengths" to "variable operator lengths" in line 5 of claim 5, line 7 of claim 7, lines 1 and 2 of claim 8, and lines 1, 2 and 3 of claim 9. This amendment makes the wording consistent with the corresponding wording in line 2 of claim 1 and consistent with the usage throughout the specification of the application as filed. In particular, this amendment makes the wording in the limitation given in line 5 of claim 5 consistent with the corresponding wording in step 204 of figure 2, as discussed in paragraph [0049] of the specification and makes the wording in the limitation given in line 7 of claim 7 consistent with the corresponding wording in step 306 of figure 3, as discussed in paragraph [0067] of the specification.

Claim 6 is corrected to correct a typographical error by changing the claim dependence from claim 4 to claim 5. This amendment makes the wording referring to pairs of operator half-

lengths in the limitations given in lines 2-4 and 5-6 of claim 6 consistent with the wording referring to operator lengths in the corresponding limitations given in lines 8-9 and 10, respectively of claim 5.

In the Office Action, the Examiner first cites prior art made of record, although not relied upon, but considered pertinent to applicant. The Examiner cites Meng, U.S. Patent No. US-6,519,532, for a method for 3-D depth migration and states that Meng '532 discloses all the limitations of independent claim 1 in figure 1 with all the elements of figure 1 and the 3-D seismic data volume in lines 10-40 of column 3. The Examiner further states that Meng '532 discloses the downward extrapolation with corrections for azimuthal error in lines 10-60 of column 4.

However, in Meng '532, all extrapolation operators disclosed have fixed operator lengths, rather than variable operator lengths. In Meng '532, the extrapolation operator disclosed is Hale-McClellan 3D Prestack Depth Migration (HM 3DPSDM). To correct for azimuthal error due to horizontal and lateral variations in migration velocity, extrapolation is followed by Gazdag's Phase Shift Plus Interpolation (PSPI) in combination with tapering and Li-correction operators. (See, for example, column 2, lines 43-52; column 3, lines 17-22 and 34-39; and column 4, lines 22-43 of Meng '532.) HM 3DPSDM and the accompanying PSPI, tapering, and Li-correction are all taught in the literature with fixed length operators. Nothing in Meng '532 provides for varying the length of the extrapolation operators. Thus, Meng '532 neither teaches nor suggests a method for "constructing explicit depth extrapolation operators with variable operator lengths", as in the present invention, as embodied in independent claim 1.

In the Office Action, the Examiner has rejected claims 1-16 under 35 U.S.C. §102(b), as being anticipated by Soubaras, in U.S. Patent No. US-5,583,826.

With regard to claim 1, the Examiner states that Soubaras '826 discloses all the limitations for claim 1 and the seismic data programming in figure 1. The Examiner states that Soubaras '826 discloses (1) constructing explicit depth extrapolation operators, in lines 1-60 of columns 1 and 2 of Soubaras '826; (2) the problem of using dip angles with implicit methods, in lines 10-25 of column 2 of Soubaras '826; (3) constructing a group of operator tables in advance, in lines 25-30 of column 2 of Soubaras '826; and (4) using wave numbers and a discretely-sampled grid, in lines 35-50 of column 2 of Soubaras '826.

However, in Soubaras '826, all extrapolation operators disclosed have fixed operator lengths, rather than variable operator lengths. In Soubaras '826, the extrapolation operator disclosed is an approximation by a polynomial of the minus Laplacian, which in turn is an approximation by a sum of two one-dimensional filters (see, for example, column 5, lines 42-50 and column 8, lines 31-49 of Soubaras '826). The form of the approximations to the polynomial of the minus Laplacian and the sum of the two one-dimensional filters are operators of fixed operator length (see, for example, the equations and accompanying text in column 5, lines 51-64 and column 8, lines 50-67 of Soubaras '826). The equations defining the extrapolation operator are solved in the L^∞ norm sense using the Remez Exchange Algorithm, which does not vary the operator lengths (see, for example, column 7, lines 1-64 of Soubaras '826). Nothing in Soubaras '826 provides for varying the length of the extrapolation operators. Thus, Soubaras '826 neither teaches nor suggests a method for "constructing explicit depth extrapolation operators with variable operator lengths", as in the present invention, as embodied in independent claim 1.

Further, the Examiner states that Soubaras '826 anticipates claims 2-16. With regard to claims 2-10, the Examiner states that Soubaras '826 teaches, in column 2, processing steps for selecting dip angle, type of operator, and wavenumber and then performing explicit extrapolation. With regard to claims 11-16, the Examiner states that Soubaras '826 teaches, in columns 3 and 4, steps for selecting types of extrapolation operators. However, since independent claim 1 is allowable, its dependent claims 2-16 are also allowable. (Applicant also notes that columns 1-4 of Soubaras '826 contains only state of the art material and does not disclose any means for varying extrapolation operator length.)

Thus, neither Meng '532 nor Soubaras '826 teach or suggest a method for "constructing explicit depth extrapolation operators with variable operator lengths", as in the present invention, as embodied in independent claim 1. Therefore, the subject matter of independent claim 1 and its dependent claims 2-16, as amended, of the present application cannot be derived from any of the patents cited by the Examiner, alone or in combination, in an obvious way.

Thus, applicant believes that claims 1-16 are ready for acceptance. Applicant respectfully requests their reconsideration and acceptance.

Respectfully submitted,

Date: August 18, 2005


Charles R. Schweppe, Reg. No. 38,612
8144 Landau Park Lane
Spring, TX 77379-7169

Counsel of Record
E. Eugene Thigpen, Reg. No. 27,400
Petroleum Geo-Services, Inc.
15150 Memorial Drive
Houston, TX 77079
Telephone: 281-509-8368
Facsimile: 281-509-8085